Attorney Docket No.: 21535-006
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Date of Deposit: March 27, 2001

WHAT IS CLAIMED IS:

1. A fuel cell system comprising:

an anode chamber having a fuel;

a cathode chamber in fluid communication with an oxidizing agent;

a proton conducting membrane electrolyte separating said chambers; and

a first valve for controlling a first flow of a gas from said anode chamber into said cathode chamber.

2. The fuel cell system according to claim 1, further comprising:

a gas plenum; and

a second valve, wherein

said first valve controls said first flow of said gas from said anode chamber into said gas plenum, and

said second valve controls a second flow of said gas collected in said gas plenum into said cathode chamber.

3. The fuel cell system according to claim 1 or 2, wherein said fuel cell is a direct oxidation fuel cell.

4. The fuel cell system according to claims 1 or 2, wherein said fuel comprises methanol.

5. The fuel cell system according to claim 2, wherein said first valve is in fluid communication with anode chamber and said gas plenum.

6. The fuel cell system according to claim 2,wherein said second valve is in fluid communication with said fluid plenum and said cathode chamber.

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7. The fuel cell system according to claim 2, further comprising:

a fluid plenum;

a third valve for controlling said second flow out of an outlet of said cathode chamber and into said fluid plenum and into an exhaust port;

a fourth valve for controlling a third flow from said fluid plenum into said anode chamber.

8. The fuel cell system according to claim 7, wherein said fourth valve also controls a fourth flow of fuel from a fuel supply to said anode chamber.

9. The fuel cell system according to claim 7, wherein said third valve is in fluid communication with:

said outlet of said cathode chamber,

said exhaust port, and

said fluid plenum,

wherein

said third valve allows said second flow between said outlet of said cathode chamber and said exhaust port when placed in a first position, and

said third valve allows said second flow between said outlet and said fluid plenum when placed in a second position.

10. The fuel cell system according to claim 7, wherein said fourth valve is in fluid communication between said anode chamber and said fluid plenum.

11. The fuel cell system according to claim 7, wherein said fourth valve is in fluid communication with:

said anode chamber,

said fuel supply, and

said fluid plenum,

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wherein

said fourth valve allows said third flow when placed in a first position, and

said fourth valve allows said fourth flow when placed in a second position.

12. The fuel cell system according to any one of claims 1-2 and 5-11, wherein at least one of said flows between elements is conducted through a conduit.

13. The fuel cell system according to claim 2, wherein said anode chamber is provided with a fuel displacement sensor.

14. The fuel cell system according to claim 2, wherein said anode chamber is provided with a gas pressure sensor.

15. The fuel cell system according to claim 2, wherein said anode chamber is provided with a fuel concentration sensor.

16. The fuel cell system according to claim 1, wherein said first valve comprises a pressure relief valve.

17. The fuel cell system according to claim 1, wherein said first valve comprises a gas permeable membrane.

18. The fuel cell system according to claim 2, wherein at least one of said first and said second valve comprises a pressure relief valve.

19. The fuel cell system according to claim 1, wherein at least one of said first and said second valve comprises a gas permeable membrane.

20. The fuel cell system according to claim 2, further comprising a controller.

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21. The fuel cell system according to claim 20, wherein said controller includes a timer for tracking the amount of time said cell generates electrical energy.

22. The fuel cell system according to claim 20, wherein said controller includes an electric meter for monitoring an amount of electric energy produced by said cell.

23. The fuel cell system according to claims 1 or 2, further comprising a diffusion layer provided in at least one of said chambers.

24. The fuel cell system according to claims 1 or 2, wherein said membrane electrolyte is electronically non-conducting.

25. A method of reducing the amount of water in a cathode chamber of a fuel cell system comprising:

collecting an effluent gas produced by an anode chamber of said fuel cell; and

exhausting said collected gas through said cathode chamber when an amount of said effluent gas produced reaches a predetermined value.

26. In a fuel cell system comprising:

an anode chamber having a fuel,

a cathode chamber in fluid communication with an oxidizing agent,

a proton conducting membrane electrolyte separating said chambers,

a valve for controlling a flow of a gas from said anode chamber into said cathode chamber, and

a method for reducing the amount of water in said cathode chamber comprising:

closing said valve;

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collecting an effluent gas produced by fuel oxidation in said anode chamber;

opening said valve when an amount of said effluent gas reaches a predetermined value.

27. In a fuel cell system comprising:

an anode chamber having a fuel,

a cathode chamber in fluid communication with an oxidizing agent,

a proton conducting membrane electrolyte separating said chambers,

a gas plenum,

a first valve for controlling a first flow of a gas from said anode chamber into said gas plenum, and

a second valve for controlling a second flow of said gas collected by said gas plenum into said cathode chamber,

a method for reducing the amount of water in said cathode chamber comprising:

opening said first valve allowing said first flow while said second valve is closed between said gas plenum and said cathode chamber;

collecting an effluent gas produced by fuel oxidation in said gas plenum via said first flow;

closing said first valve when an amount of said effluent gas reaches a predetermined value; and

opening said second valve allowing said second flow.

28. The method according to claim 27, wherein said first flow and said second flows communicate between elements via conduits.

29. The method according to claim 27, wherein prior to closing said first valve, said method further comprises determining said amount of said effluent gas.

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30. The method according to claim 29, wherein determining said amount of said effluent gas comprises determining an amount that said fuel is displaced by said effluent gas.

31. The method according to claim 29, wherein determining said amount of said effluent gas comprises determining a pressure of said anode chamber.

32. The method according to claim 29, wherein determining said amount of said effluent gas comprises determining a concentration of said fluid.

33. The method according to claim 29, wherein determining said amount of said effluent gas comprises determining a time that said fuel cell has been in operation.

34. The method according to claim 29, wherein determining said amount of said effluent gas comprises determining an amount of energy produced by said fuel cell.

35. The method according to claim 29, wherein while said first valve is open, said second valve communicates an oxidizer from an external source into said cathode chamber.

36. A direct methanol fuel cell system comprising:

an anode chamber having a fuel mixture comprising methanol and water, and a diffusion layer;

a fuel supply cartridge in fluid communication with said anode chamber;

a cathode chamber having a cathode and a diffusion layer, wherein said diffusion layer is in fluid communication with an oxidizer;

a proton conducting, electrical non-conducting membrane electrolyte separating said chambers and positioned substantially adjacent to said diffusion layers, said membrane including a catalyst exposed to each said chamber;

a gas plenum;

a first valve for controlling a first flow of carbon dioxide gas from said anode chamber into said gas plenum;

a second valve for controlling a second flow of carbon dioxide from said gas plenum into said cathode chamber, and for controlling a third flow of said oxidizer into said cathode chamber;

a sensor for detecting an amount of carbon dioxide gas; and

a controller for actuating said first valve and said second valve when said amount of carbon dioxide gas reaches a predetermined value.

37. A water management system for a fuel cell system, said fuel cell system comprising:

an anode chamber having a fuel,

a cathode chamber in fluid communication with an oxidizing agent,

a proton conducting membrane electrolyte separating said chambers,

said water management system comprising a first valve for controlling a first flow of a gas from said anode chamber into said cathode chamber.

38. The water management system according to claim 37, further comprising:

a gas plenum; and

a second valve, wherein

said first valve controls said first flow of said gas from said anode chamber into said gas plenum, and

said second valve controls a second flow of said gas collected in said gas plenum into said cathode chamber.

39. The water management system according to claim 38, further comprising:

a fluid plenum; and

a third valve for controlling said second flow out of an outlet of said cathode chamber and into said fluid plenum and into an exhaust port; and

a fourth valve for controlling a third flow from said fluid plenum into said anode chamber.

40. In a water management system for a fuel cell system, said fuel cell system including:

an anode chamber including a fuel, a cathode chamber in fluid communication with an oxidizing agent and a proton conducting membrane electrolyte separating said chambers,

said water management system comprising a gas plenum, a first valve for controlling a first flow of a gas from said anode chamber into said gas plenum, and a second valve for controlling a second flow of said gas collected by said gas plenum into said cathode chamber,

a method for reducing the amount of water in said cathode chamber comprising:

opening said first valve allowing said first flow while said second valve is closed between said gas plenum and said cathode chamber;

collecting an effluent gas produced by fuel oxidation in said gas plenum via said first flow;

closing said first valve when an amount of said effluent gas reaches a predetermined value; and

opening said second valve allowing said second flow.

41. A fuel cell system comprising:

an anode chamber having a fuel;

a cathode chamber in fluid communication with an oxidizer, said cathode chamber having an inlet positioned a first end of said cathode chamber and an outlet positioned adjacent a second end of said cathode chamber;

a proton conducting membrane electrolyte separating said chambers and having an effluent gas-permeable portion allowing effluent gas produced in said anode chamber to flow into said cathode chamber; and

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a nozzle having an inlet positioned adjacent said gas-permeable portion in said cathode chamber and an outlet positioned adjacent said outlet of said cathode chamber.

42. The fuel cell system according to claim 41, wherein said outlet of said nozzle is smaller than said inlet of said outlet.

43. The fuel cell system according to claim 41, further comprising a mixing chamber positioned adjacent said collar and said outlet of said cathode chamber.

44. The fuel cell system according to claim 41, further comprising a vent collar positioned adjacent said outlet end of said nozzle.

45. A method for removing water in a cathode chamber of a fuel cell system, said fuel cell system comprising an anode, a cathode having an inlet and an outlet, and a membrane electrolyte having a gas-permeable portion, said method comprising:

directing an effluent gas produced in said anode chamber from said gas-permeable portion into said outlet at a pressure;

establishing a low pressure region adjacent said outlet;

inducing a flow from said inlet through said chamber and exiting said outlet.

46. The method according to claim 45, further comprising equalizing said first pressure to an ambient pressure adjacent said outlet of said cathode chamber.